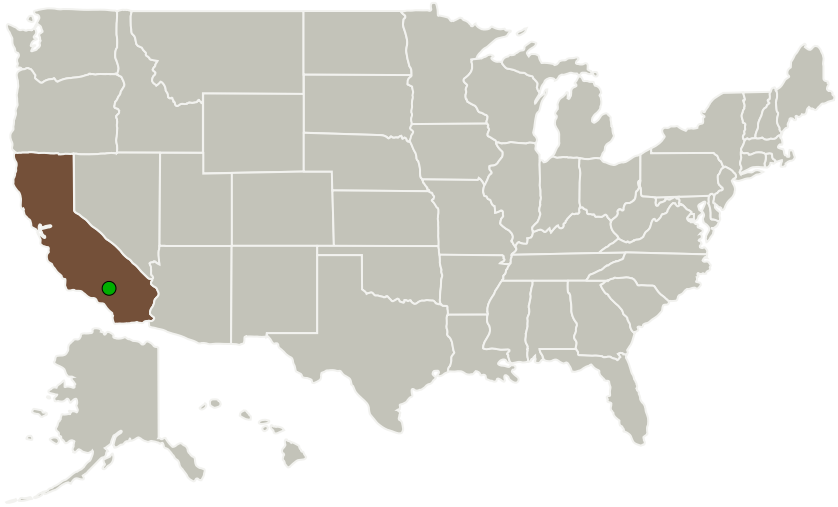
Novel, Nanotechnology Based CMC Composites for Hot Structures, Phase I

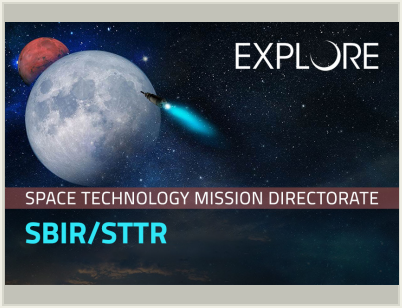
Completed Technology Project (2014 - 2014)

Project Introduction

Very extensive R&D efforts over the past several decades resulted in several classes of high temperature composites offering potential for future hypersonic vehicles hot structures. Of particular interest is a hybrid carbon/SiC matrix composite utilizing carbon fiber. This class of composite, which utilizes Phenolic prepreg to form the initial composite structure, lends itself to the fabrication of large very complex structures. Typically, these composites are densified via PIP processing. However, there are deficiencies in this material system. The nature of PIP processing results in an appreciable amount of open porosity, requiring a CVD SiC external coating for oxidation protection. The application of CVD SiC to large structures is quite limited due to cost factors. Also, since the composites are fabricated using 2D fabric, the transverse mechanical properties are typically low. This proposal offers a highly innovative approach to alleviate the above mentioned shortcomings. First, it utilizes nanotechnology at the composite molding stage, enabling enhanced in plane and transverse mechanical properties. Secondly, it offers a highly unique, non CVD external coating technology. It enables the fabrication of large, complex parts with greatly reduced manufacturing cost when compared with conventional CVD SiC.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Allcomp Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations
California

Project Transitions

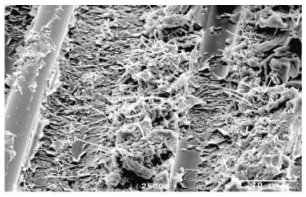
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138383)*

Images



Briefing Chart
Novel, Nanotechnology Based CMC Composites for Hot Structures, Phase I
(https://techport.nasa.gov/image/128621)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Allcomp Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

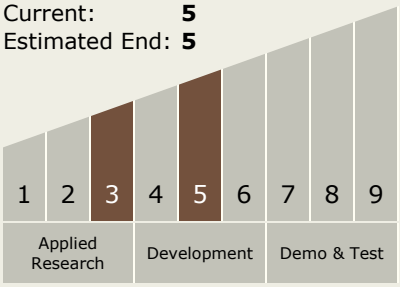
Carlos Torrez

Principal Investigator:

Steve Jones

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System